PLANT ITEM MATERIAL SELECTION DATA SHEET

R10633654

HDH-VSL-00001 (HLW)
Rinse Tunnel Canister Rinse Vessel

ISSUED BY
RPP-WTP PDC

- Design Temperature (°F) (max/min): 212/50
- Design Pressure (psig) (internal/external): 10/atm
- Location: out cell

Contents of this document are Dangerous Waste Permit affecting

Operating conditions are as stated on sheets 5 and 6

Small amounts of chloride, fluoride, and sulfate are expected to be on the canister surface. The material dissolved in the wash must be kept dilute and no evaporation allowed.

Assumptions:
Surfaces will be kept clean. Vessel will be rinsed with DIW and drained dry. It is assumed that no solids will accumulate.

Operating Modes Considered:
- The vessel contains a canister and is sprayed with water at the normal operating temperature.

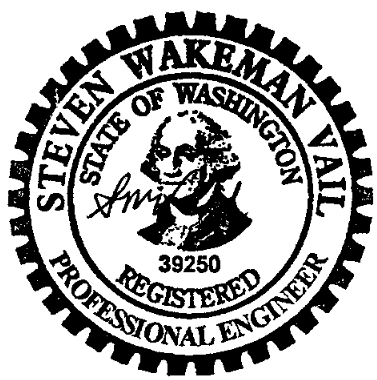
Materials Considered:

Material (UNS No.)	Relative Cost	Acceptable Material	Unacceptable Material
Carbon Steel	0.23		X
304L (S30403)	1.00		X
316L (S31603)	1.18	X	
6% Mo (N08367/N08926)	7.64	X	
Alloy 22 (N06022)	11.4	X	
Ti-2 (R50400)	10.1	X	

Recommended Material: 316 (max 0.030% C; dual certified)

Recommended Corrosion Allowance: 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)

Process & Operations Limitations:
- Develop procedure for water flushing and rinsing.



10/10/05

EXPIRES: 12/07/05

Please note that source, special nuclear and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the U.S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

This bound document contains a total of 6 sheets.

REV	DATE	REASON FOR REVISION	PREPARER	CHECKER	APPROVER
1	10/10/05	Issued for Permitting Use			
0	3/15/04	Issued for Permitting Use	DLA	JRD	APR

PLANT ITEM MATERIAL SELECTION DATA SHEET

Corrosion Considerations:

The filled canister is placed in the HDH-VSL-00001 after lid-closure. While in the rinse vessel, the canister is sprayed with DIW to remove loose contamination from the canister.

a General Corrosion
The uniform corrosion rate of the 300 series stainless steels in DIW at temperatures up to about boiling are generally considered small, <1 mpy.

Conclusion:
304L or 316L are acceptable for this system.

b Pitting Corrosion
Chloride is notorious for causing pitting of stainless steel type alloys in neutral solutions. The pH in this vessel is near neutral but no reportable quantities of halides will be present. Pitting is unlikely unless the solution is stagnant or the halides are allowed to concentrate by evaporation.

Conclusion:
A clean vessel of 304L is expected to be satisfactory. Due to temperature and possible evaporation and associated build-up of solids, more pitting resistant alloys such as 316L are recommended.

c End Grain Corrosion
End grain corrosion only occurs in metal with exposed end grains and in highly oxidizing acid conditions.

Conclusion:
Not applicable to this system.

d Stress Corrosion Cracking
The exact amount of chloride required to stress corrosion crack stainless steel is unknown. In part this is because the amount varies with temperature, metal sensitization, the environment and because chloride tends to concentrate under heat transfer conditions, by evaporation, and electrochemically during a corrosion process. Hence, even as little as 10 ppm can lead to cracking under some conditions. Generally, as seen in Sedriks (1996) and Davis (1994), stress corrosion cracking does not usually occur below about 140°F. Further, the use of "L" grade stainless reduces the opportunity for sensitization and, therefore, the likelihood of cracking.

Conclusion:
The use of 304L and 316L are expected to be acceptable with 316L marginally better.

e Crevice Corrosion
The comments on Pitting are equally valid here.

Conclusion:
The Pitting conclusions are applicable.

f Corrosion at Welds
Weld corrosion is not considered a problem in the proposed environment.

Conclusion:
Weld corrosion is not considered a problem for this system.

g Microbiologically Induced Corrosion (MIC)
MIC is commonly observed at the expected pH and temperature conditions. It is less likely because of the use of DIW. If the system is dried, the high radiation field is expected to prevent MIC.

Conclusion:
MIC is not considered a problem.

PLANT ITEM MATERIAL SELECTION DATA SHEET

h Fatigue/Corrosion Fatigue
Corrosion fatigue is not a concern.

Conclusions
Not considered a problem

i Vapor Phase Corrosion
The vapor phase portion of the tank will be continually washed. Prevention of evaporation will minimize the opportunity for vapor phase corrosion.

Conclusion:
No vapor phase corrosion is anticipated.

j Erosion
Velocities are expected to be low. Erosion allowance of 0.004 inch for components with low solids content (< 2 wt%) at low velocities is based on 24590-WTP-RPT-M-04-0008.

Conclusion:
Not expected to be a concern.

k Galling of Moving Surfaces
Not applicable.

Conclusion:
Not applicable.

l Fretting/Wear
Not applicable.

Conclusion:
Not applicable.

m Galvanic Corrosion
Not applicable.

Conclusion:
Not applicable.

n Cavitation
Not applicable.

Conclusion:
Not applicable.

o Creep
Not applicable.

Conclusion:
Not applicable.

p Inadvertent Addition of Nitric Acid
Higher chloride contents and higher temperatures usually require higher alloy materials. Nitrate ions inhibit the pitting and crevice corrosion of stainless alloys. Furthermore, nitric acid passivates these alloys; therefore, lower pH values brought about by increases in the nitric acid content of process fluid will not cause higher corrosion rates for these alloys. The upset condition that was most likely to occur is lowering of the pH of the vessel content by inadvertent addition of 1 M nitric acid. Lowering of pH may make a chloride-containing solution more likely to cause pitting of stainless alloys. Increasing the nitric acid content of the process fluid adds more of the pitting-inhibiting nitrate ion to the process fluid. In addition, adding the nitric acid solution to the stream will dilute the chloride content of the process fluid. In the case of HDH-VSL-00001, there is no reportable chloride concentration, so lowering the pH from neutral to acidic would not be a concern.

Conclusion:
The recommended materials will be able to withstand a plausible inadvertent addition of 1 M nitric acid.

PLANT ITEM MATERIAL SELECTION DATA SHEET

References:

1. 24590-WTP-RPT-M-04-0008, Rev. 2, *Evaluation Of Stainless Steel Wear Rates In WTP Waste Streams At Low Velocities*
2. 24590-WTP-RPT-PR-04-0001, Rev. B, *WTP Process Corrosion Data*
3. Davis, JR, 1994, *Stainless Steels*, In ASM Metals Handbook, ASM International, Metals Park, OH 44073
4. Sedriks, AJ, 1996, *Corrosion of Stainless Steels*, John Wiley & Sons, Inc., New York, NY 10158

Bibliography:

1. Hamner, NE, 1981, *Corrosion Data Survey*, Metals Section, 5th Ed, NACE International, Houston, TX 77218
2. Jones, RH (Ed.), 1992, *Stress-Corrosion Cracking*, ASM International, Metals Park, OH 44073
3. Koch, GH, 1995, *Localized Corrosion in Halides Other Than Chlorides*, MTI Pub No. 41, Materials Technology Institute of the Chemical Process Industries, Inc., St Louis, MO 63141
4. Uhlig, HH, 1948, *Corrosion Handbook*, John Wiley & Sons, New York, NY 10158
5. Van Delinder, LS (Ed), 1984, *Corrosion Basics*, NACE International, Houston, TX 77084

PLANT ITEM MATERIAL SELECTION DATA SHEET

OPERATING CONDITIONS

24590-WTP-RPT-PR-04-0001, Rev. B
WTP Process Corrosion Data

PROCESS CORROSION DATA SHEET

Component(s) (Name/ID #) Rinse tunnel canister rinse vessel (HDH-VSL-00001)

Facility HLW

In Black Cell? No

Chemicals	Unit[1]	Contract Maximum		Non-Routine		Notes
		Leach	No leach	Leach	No Leach	
Aluminum	g/l					
Chloride	g/l					
Fluoride	g/l					
Iron	g/l					
Nitrate	g/l					
Nitrite	g/l					
Phosphate	g/l					
Sulfate	g/l					
Mercury	g/l					
Carbonate	g/l					
Undissolved solids	wt %					
Other (NaMnO4, Pb,...)	g/l					
Other	g/l					
pH	N/A					Note 3
Temperature	°F					Note 2

List of Organic Species:

References

System Description: 24590-HLW-3YD-HDH-00001, Rev 0
Mass Balance Document: 24590-WTP-M4C-V11T-00005, Rev A
Normal Input Stream # : HDH13, HDHXX (canister soluble solids)
Off Normal Input Stream # (e.g., overflow from other vessels): N/A
P&ID: 24590-HLW-M6-HDH-00002, Rev 1
PFD: 24590-HLW-M5-V17T-00006, Rev 4
Technical Reports:

Notes:

1. Concentrations less than 1x 10^{-4} g/l do not need to be reported; list values to two significant digits max.
2. Tmin 50 °F, Tnorm 68 °F, Tmax 212 °F (24590-HLW-MVD-HDH-00009, Rev 0)
3. Average will be pH 7

Assumptions

24590-WTP-RPT-PR-04-0001, Rev. B
WTP Process Corrosion Data

5.2.3 Rinse Tunnel Canister Rinse Vessel (HDH-VSL-00001)

Routine Operations

The rinse tunnel canister rinse vessel (HDH-VSL-00001) is located on the rinse bogie in the canister rinse bogie tunnel. The rinse tunnel canister rinse vessel is used for transporting and washing the filled canisters. The water rinse cleans loose contamination from the canister to keep the decontamination cave as clean as possible. The rinse tunnel canister rinse vessel has the bogie decon canister pump running during the batch transfers so that the batch is pumped out as the batch is added in. Therefore, the rinse tunnel canister rinse vessel is not required to hold the entire batch volume of demineralized water during normal operations. The rinse tunnel canister rinse vessel is equipped with service piping for demineralized water, a spray ring assembly that rinses the entire canister, level transmitter and a level switch, a pump suction line and centrifugal pump from the rinse tunnel canister rinse vessel (HDH-VSL-00001) to the waste neutralization vessel (HDH-VSL-00003), and a plant service air line for the inflatable seal.

Non-Routine Operations that Could Affect Corrosion/Erosion

None identified.